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Banksia woodlands: Summary and conclusions

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Introduction

The *Banksia* woodlands that have been the subject of these series of papers are surprisingly poorly studied and documented. Perhaps this is due, at least partly, to their location close to Perth—they are too familiar to many scientists who have preferred to work in less familiar and perhaps more "exotic" surroundings. However, it is their closeness to Perth that makes the *Banksia* woodlands an ideal place for scientific research since they are ideally located for low cost studies and have been and are subjected to various land-use pressures that are causing many changes.

Environment and Conservation

The *Banksia* woodlands of the Swan Coastal Plain grow on deep Quaternary sands with a very low nutrient level. They are subjected to a typically Mediterranean climate of cool, mild winters and hot, dry summers. They have a rich flora and fauna, with much variation over 4° of latitude and between the different soil types. However, there are relatively few endangered species.

Because of their proximity to Perth, *Banksia* woodlands are being destroyed at a rapid rate. While some conservation reserves protect samples of *Banksia* woodland, not all the types of woodland are protected at present, nor are all the reserves large enough to be viable. Additionally, the reserves are threatened by a variety of disturbers.

Resources

The resources of the *Banksia* woodlands can be divided into three categories:

Land Resources

The land is used for urban and industrial purposes, food growing, horticulture and pine plantations, and recreation. Urban development and its associated land uses are leading to the destruction of increasing areas of *Banksia* woodland.

Natural Non-renewable Resources

The chief demands for non-renewable resources are for basic raw materials used in construction, brick making, road building, etc. and for minerals. The demand for minerals is low and restricted mainly to silica and limestone. The amount of *Banksia* woodland destroyed by demand for basic raw materials is related largely to the growth of Perth.

Natural Renewable Resources

The most important of these are groundwater and the biological resources—the indigenous plants and animals that make up a genetic storehouse for the future. Demand for groundwater is related to the growth of Perth.

Disturbers of Natural *Banksia* Woodlands

Those *Banksia* woodlands that are not cleared for urban or other use are subject to many disturbers. Among the most important are:

Fire

Mediterranean climatic areas are typically affected by high intensity summer wildfires and the *Banksia* woodlands are no exception. Aboriginal firing would have occurred for many thousands of years but there are few data on their extent, frequency or timing. With recent urbanization and increases in human population fires are likely to have increased in frequency at least.

Disease

Phytophthora cinnamomi, an introduced fungus that destroys roots, is now a major disease of native and exotic plant communities of the *Banksia* woodlands. Other *Phytophthora* spp. occur also.

Weeds

Numerous environmental weeds are now established in *Banksia* woodland communities. They are competing with and probably eliminating some native species.

Feral Animals

A variety of introduced animals has become feral in *Banksia* woodlands. This includes the rabbit, house mouse, black and brown rats, cats, foxes, dogs and, near Perth, even polecats (or ferrets). Their effects on plant and animal communities are only beginning to be understood. Overgrazing and selective grazing are destroying components of the flora, and predation has eliminated or is eliminating some native animals.

Pollution

Urban and industrial pollution has so far had the greatest effect on wetlands, *via* increased nutrients in the water table, rivers, estuaries and lakes.

Groundwater Extraction

Groundwater extraction can lower the water table and lead to the death of some plants and a reduction in the size of wetlands or the length of time that they contain water.

Recreation

Human use can lead to degradation of the land and its plant and animal communities. Damage can come from off-road vehicles, rubbish-dumping and walking paths.

Synergism

A major problem of understanding the effects and relative importance of the various disturbers is that most of them are interrelated and, indeed, their effects may be synergistic. For example, frequent fires combined with exotic grazing and

browsing animals will lead to the degradation of the vegetation much faster than would be expected from the simple addition of the effects of the two disturbers measured in isolation, and the invasion of weeds is much faster in the presence of soil disturbance or frequent fire.

Future Management Strategies

If *Banksia* woodlands are to be used for the long-term benefit of the people of Western Australia it is clear that strategies will have to be developed and applied to prevent their total destruction or near destruction plus degradation of the remnants. Of particular importance are:

1 Further documentation of biological resources and environmental dynamics.

2 Increased research into and management of

- plant disease, especially *Phytophthora cinnamomi*
- fire regimes
- groundwater extraction
- recreation
- the "greenhouse effect"

3 Continued land-use planning, including a refinement of the system of nature conservation reserves.

4 A continuing debate in the community about the acceptable limits to the growth of Perth.

5 Education. Without improved education about *Banksia* woodlands, most of the above points are unattainable.